

REMARKS

This is to acknowledge that with the exception of Claim 72, all of the claims were allowed in the above-identified application. In response to that Office Action, however, Applicant has cancelled the claims and has submitted new set of Claims 73-81 which are drafted along the same lines as the allowed claims, but which are presented in a manner to provide a clear distinction over newly cited references which are being submitted with an Information Disclosure Statement filed herewith. In this regard, all of the new claims are believed to be patentable over the newly cited prior art identified in that Information Disclosure Statement for the reasons given below.

In particular, new independent Claim 73 requires that "the analog operational amplifier includes a function for reducing its power consumption based on an external signal". This feature provides an advantage of reducing noise.

In the case of a photoelectric conversion circuit section used in X-ray detection apparatus, such as a medical machine wherein a high S/N ratio is required, it is desirable to reduce the lengths of signal wires in order to provide noise durability. To do this, it is necessary to dispose the reading circuit section, as a configuration of IC chip, in a vicinity of the photoelectric conversion circuit section. However, in such structure, due to heat generated by the reading circuit section of the IC chip, the temperature of the photoelectric conversion circuit section may increase. In particular, a pixel in the vicinity of the reading circuit section is affected to a greater degree by the heat generation as compared to a pixel distant from the reading circuit section. When there is a larger

temperature difference within the photoelectric conversion circuit section, dark current characteristics within the photoelectric conversion circuit section may be larger. In particular, in a case of the photoelectric conversion circuit section using an amorphous silicon TFT as the switching element, such as the present invention, as the temperature increases, the dark current in the off state of the amorphous silicon TFT would be larger, and the dark current variation within the photoelectric conversion circuit section would be made significant. Accordingly, the thermal generation in the reading circuit section would undesirably make larger "a fixed pattern noise as the photoelectric conversion device". That problem, which is solved by the present invention is inherent to X-ray detection apparatus using a photoelectric conversion device having "the switch element of a thin film transistor having a semiconductor layer of amorphous silicon semiconductor" as stated in the present Specification.

According to the present invention, in order to solve the problem, "the analog operational amplifier has a function for reducing a power consumption thereof based on an external signal". Thereby, the "the temperature of the photoelectric conversion circuit section disposed around it can be prevented from increasing because of heat generation of the reading circuit section (IC), increase in the dark current "upon OFF" of TFTs of the switching elements can be decreased, and the fixed pattern noise of the photoelectric conversion apparatus can be decreased." That is a significant advantage of the present invention. Thereby, "the demand for digitization of X-ray image information strongly desired in the medical and industrial fields can be met".

Referring to the documents 1-10 as listed in the above-mentioned Information Disclosure Statement, it is noted that those documents include:

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| 1. JPA Laid-Open S63-294182; | 6. U.S. Patent 4,996,413 |
| 2. U.S. Patent 5,569,908 | 7. U.S. Patent 5,335,008 |
| 3. JPA Laid-Open S62-185471 | 8. U.S. Patent 5,339,196 |
| 4. JPA Laid-Open H04-321368 | 9. JPA Laid-Open H04-282953 |
| 5. JPA Laid-Open H05-219302 | 10. JPA Laid-Open H05-316338 |

Document 1 discloses "a coupling capacity 73 corresponding to capacitor element of the present invention", "a clamp switch 18 corresponding to a reset switch of the present invention", "a memory capacity 13-2 corresponding to a reading capacitor of the present invention", "a switch 14-2 corresponding to a transfer switch of the present invention", "output buffer amplifier 17 corresponding to a buffer amplifier of the present invention" and "a horizontal switch 6-2 corresponding to reading switch of the present invention". Also, the switch is "connected to the matrix signal wire and resets the signal wire". Document 2 discloses that the pixels 101 are each provided with a photosensitive diode PD and a switching diode SD, column conductor 103, row conductor 102, and etc is arranged on an insulating substrate 10, and Document 4 discloses that a sensor unit including a photo receiving element 2 and a thin film transistor 3, data line 14 and a sensor area including gate line 13, are disposed on an insulating substrate 1. Also, Document 6 discloses a solid state X-ray detector comprising a detector array 26 having detector 40 including a photodiode 42 and a transistor 44, a detector array 26 including row selection

line 46, a detecting circuit 70 having integrator 76 and a multiplexer 77, and a scintillator 24.

However, none of the Documents 1, 2, 4 and 6 discloses or suggests the feature that "the analog operational amplifier has a function for reducing a power consumption thereof based on an external signal" of the present invention, and the advantage obtained thereby.

The Document 5 discloses an image sensor wherein, only within a time period of receiving output instruction, the operational amplifier is supplied with current or the current supplied is increased. Document 5 recognizes that, at a time of deriving an amplified signal from an amplifier, not only a carrier charged in a capacitor at an output side thereof is transferred to a gate capacitor of an output transistor, but also the amplified signal outputted from the operational amplifier during the deriving period contributes to charging. Within only a time period of receiving the output instruction, the operational amplifier is supplied with the current, or the supply current is increased. Thus, in any case, the driving power is improved to reduce the charging time period of the static capacitor within the output circuit, so that it charges sufficiently within the time period of deriving of the amplifying signal of the amplifying circuit. However, Document 5 fails to disclose the thermal generating of the operational amplifier and an effect on the photo sensor. Also, Document 5 fails to disclose Applicants' feature that "the switch element of the thin film transistor having a semiconductor layer of the amorphous silicon semiconductor", and that a structure is provided free from the problem of increasing the dark current at OFF of the amorphous silicon TFT. Document 5 also fails to disclose the X-ray detection apparatus

having the photoelectric conversion device including having "the switch element of the thin film transistor having a semiconductor layer of the amorphous silicon semiconductor".

Accordingly, Document 5 fails to recognize the problem solved by the present invention.

The other Documents 3, and 7-10 also fail to disclose the radiation image pickup apparatus wherein the analog operational amplifier has a function for reducing the power consumption thereof based on an external signal.

Accordingly, the present invention defined in the amended claims has been patentably distinguished over such documents, and cannot be deduced therefrom.

For these various reasons it is believed that all of the newly presented claims are allowable, wherefore the issuance of a Notice of Allowance is solicited.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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